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ABSTRACT

Text, illustrations, and exercises are utilized in this set of four learning modules designed to instruct non-professional dental personnel in selected job-related skills. The first module, by Gary E. Hayes, describes how to locate the hinge axis point of the jaw, place and secure a bite fork, and perform a facebow transfer. The second module, "Oral Hygiene and Denture Care of an Edentulous Patient" by Marion McCullough, prepares the student to teach a denture patient how to discover and remove materia alba and bacterial plaque from the oral cavity and from dentures. The third module, by Wesley Wallace, describes how to properly replace the drive belt of an engine arm and handpiece dental unit. The belt of an engine arm and handpiece dental unit. The four module, by Clinton L. Nelson, teaches the student to properly mix zinc phosphate cement for cementation of a fixed dental appliance. Each of the illustrated modules outlines specific behavioral objectives, describes and illustrates procedures, provides sequential reinforcement exercises with immediate feedback, and concludes with a post-test and an accompanying answer key. The time required to complete the modules ranges from 20 to 50 minutes. (JP)

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HEALTH INSTRUCTION PACKAGES:

Dental Personnel

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THE HINGE AXIS AND FACEBOW TRANSFER

By

Gary E. Hayes, DDS

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TITLE OF PACKAGE:	The Hinge Axis and Facebow Transfer
AUTHOR:	Gary E. Hayes, DDS
INSTITUTION:	Salt Lake City, Utah
INTENDED STUDENTS:	Dental office personnel
ESTIMATED WORKING TIME:	30 minutes
MATERIALS NEEDED:	None

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INTRODUCTION

The fabrication of extensive crown and bridge work involves several individual procedures which must be performed with skill and judgement at all times. This paper will discuss one of those procedures which can be performed by auxiliary personnel. A simple but essential procedure which is of great value to the dentist, the patient, and the laboratory technician.

5

OBJECTIVES OF UNIT

Overall Objective

Dental auxiliary personnel will recognize how to locate the hinge axis and perform a facebow transfer as a routine office procedure.

Sub-Objectives

Dental auxiliary personnel will be able to describe the overall objective of the procedure and explain the individual phases for the patient's comfort and knowledge.

They will also acquire the skills necessary to locate the condylar hinge axis, place the bite fork, and perform a facebow transfer.

It is my desire that when completing the unit, auxiliary personnel will feel prepared to perform this function on another staff member.

PRACTICE EXERCISE #1

This self-instructional unit is designed to help you learn how to accomplish a facebow transfer as a routine procedure in the dental office.

OBJECTIVES

The objectives of the transfer are:

FIRST - to record on a mechanical instrument the relationship of the patient's jaw **HINGE** to the **TEETH.** Note the variations.

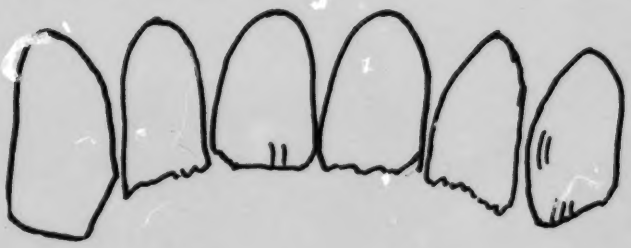
This profile looks like this underneath →

This profile looks like this underneath →

SECOND - to aid in providing the most aesthetic crowns and bridges possible.

This

Not This



1. State in your own words the two objectives of the facebow transfer:

   1)

   2)

PRACTICE EXERCISE #1 (Continued)

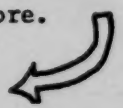
Feedback

If you remembered that the objectives were:

FIRST - to record on a mechanical instrument the relationship of the hinge to the teeth, and

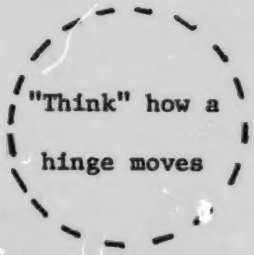
SECOND - to aid in making the most aesthetic crowns and bridges possible. Then GO on to the next page. ⇨

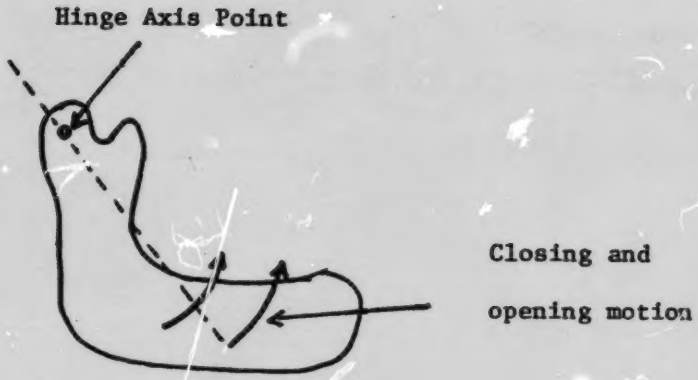
If not, go back two pages and mentally visualize the diagrams once more.



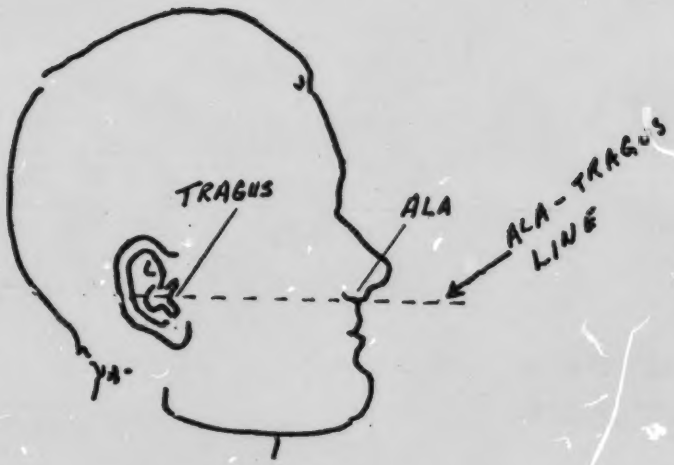
PRACTICE EXERCISE #2

The first thing you must do is to locate the hinge axis area on both sides of the face. This is simply the point around which the lower jaw moves.

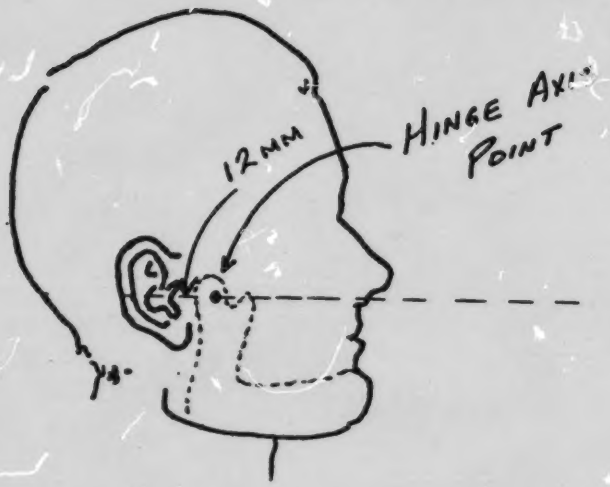




You will need to locate two landmarks on the side of the patient's face - - the TRAGUS of the ear and the ALA of the nose. Now draw an imaginary line between them - that is the Ala-Tragus line.



Measure FORWARD along that line 12 millimeters with a flexible 6" ruler and make a very small dot on the patient's face with an indelible pencil.



GOOD WORK - you have located the hinge axis area. Now repeat it for the other side of the face.

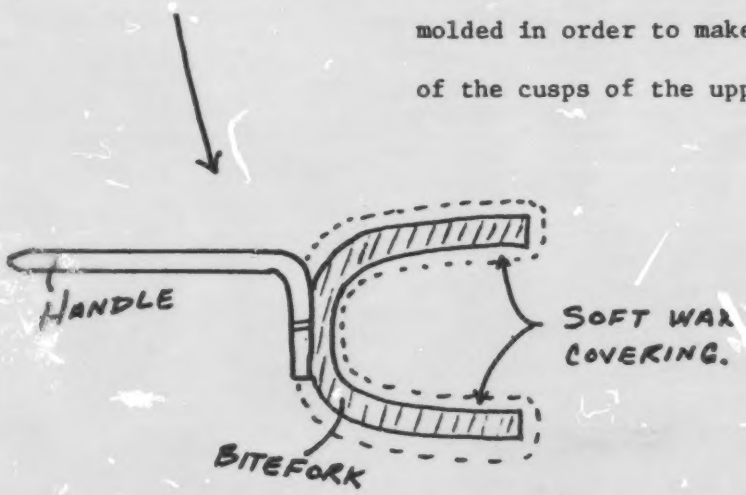
PRACTICE EXERCISE #2 (Continued)

2. On the drawing below, label the two landmarks you are going to use in this procedure and then draw a line between them. Make a dot where the hinge axis will be and then indicate in writing how many millimeters forward along that line it will be located.

Good, now for reinforcement, refer back to the labeled drawing and check for accuracy of your answers.

PRACTICE EXERCISE #3

You are now prepared to begin the bite fork placement. This is a bite fork. It is a metal fork upon which pink wax is molded in order to make an impression of the cusps of the upper teeth.



With the patient in an upright position, you should stand behind the dental chair. Ask the patient to open his mouth and insert the wax covered end of the bite fork into the mouth. You now have three things to observe.

ONE

See that the notch on the arm of the bitefork is directly in front of and centered between the two upper front teeth.

Now with a finger beneath each side for even pressure you may push the wax upward against the teeth. Push hard enough so as to make an indentation.

TWO

Be sure that all of the upper teeth make indentations in the wax. (This makes it very stable.)

You're doing great. Now you have to remove it and chill the wax. Insert it back in the patient's mouth and check for stability - (i.e. it should sit flat on the teeth and not rock back and forth)

THREE

When the bitefork is removed, chilled and reinserted, it should be stable against the teeth.

PRACTICE EXERCISE #3 (Continued)

3. Do you remember the <u>three</u> important things you must check on the bitefork? It may seem a bit foreign, but think it through and give it a try.

1)

2)

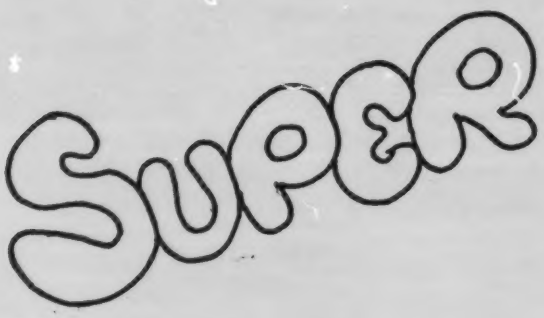
3)

PRACTICE EXERCISE #3 (Continued)

Feedback

It is really very easy. You are going to place the bitefork in a position so it:

1) Centers on the two front teeth
2) Contains indentations of all the upper teeth in the wax, and,
3) Is stable in the mouth when chilled and re-inserted.



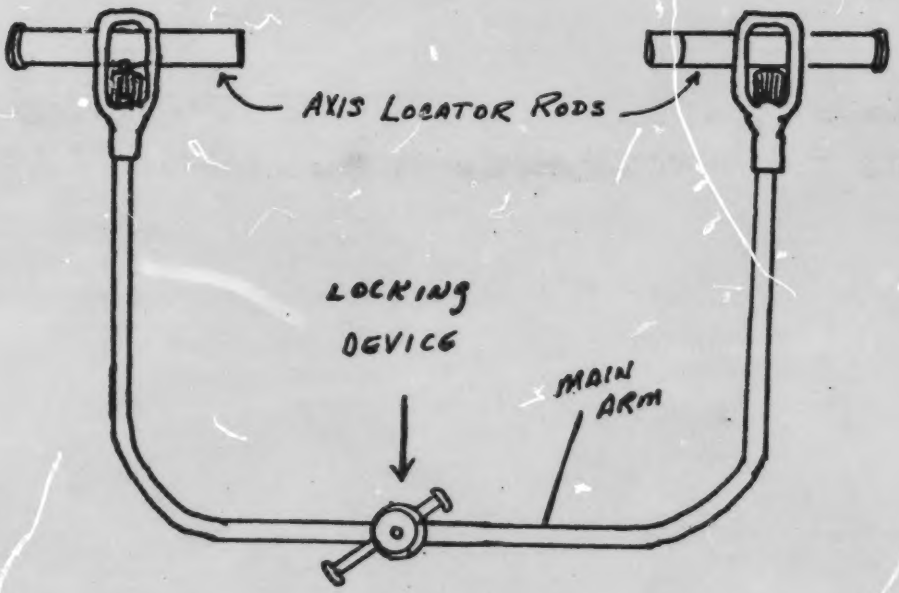
IT NOW GETS EASIER!

PRACTICE EXERCISE #4

You have now located the hinge axis area and placed the chilled bitefork in position. Have the patient hold the bitefork while you slip a cotton roll under each side. The patient can now bite down gently and the bitefork will remain in place.

This is an illustration of the FACEBOW.

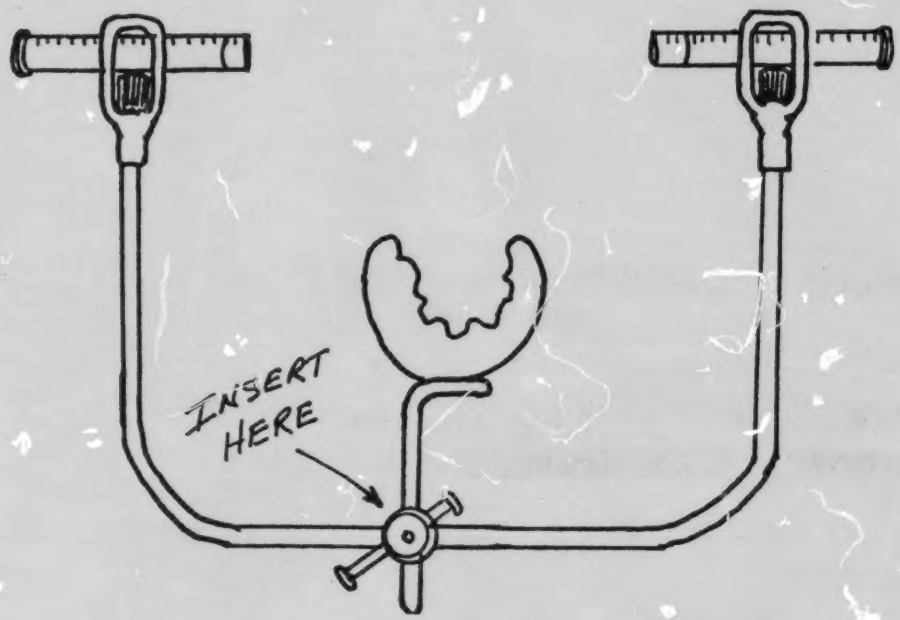
STUDY the parts for a minute or two.



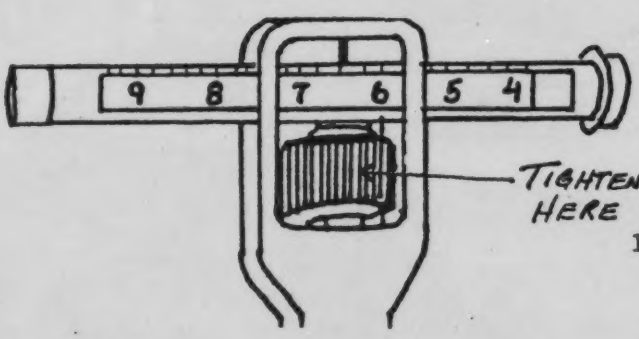
Start by opening the axis locator rods wide open and loosening the center locking device.

You are now prepared for the hookup. It will include (5) separate steps. These are numbered for your convenience.

Move again to the rear of the patient and center the facebow over the face. **1** Slide the protruding arm of the bitefork through the locking device of the facebow. It will look like this.



2 Now center the axis locator rods directly over the indelible pencil marks on the patient's face. Push the rods inward until they have equal pressure on the face. Move the facebow left or right until you read the same number on each axis locator rod scale. Now tighten the screws to hold these locator rods steady.



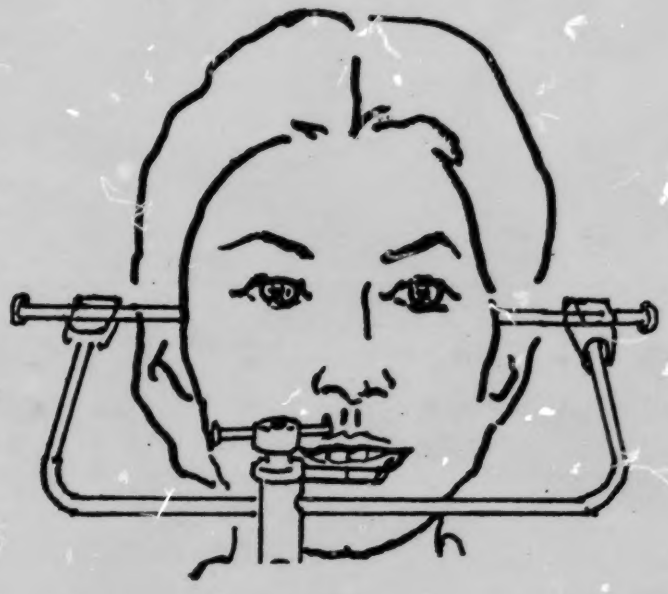
14

This reading should be equal on both sides before you tighten the knobs.

Have the patient hold the facebow in this exact position with his hands and you can move to the front of the chair.

3 Check to see that the main arm of the facebow is close to being parallel with the pupils of the eyes. - The facebow is now level and in the proper positon.

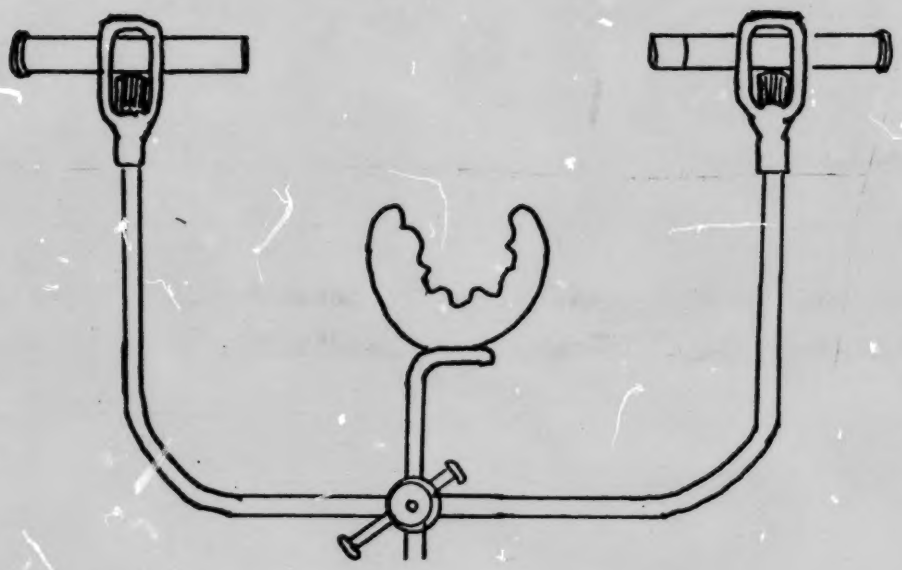
It will look like this when properly placed.



4 Holding the main arm of the facebow with one hand, tighten the locking device very tight. Remove your hands from the facebow and visually check to see if it is still level and if the locator rods are over the indelible pencil marks.

If so, open the axis locator rods, have the patient open his mouth, and remove the whole assembly. Finally, check to be sure the locking device was tight enough to prevent any movement of the bitefore while mounting the stone models.

The entire facebow transfer unit will look like this when removed:



CONGRATULATIONS!!!

"You" have just recorded the relationship of the patient's hinge area to the teeth and the unit can now be placed on articulator.

PRACTICE EXERCISE #4 (Continued)

4. Briefly describe the (5) steps in your facebow placement. Assume that the bitefork is in the patient's mouth. Your description should cover the remainder of the procedure.

1)

2)

3)

4)

5)

PRACTICE EXERCISE #4 (Continued)

Feedback

Your answers should have included these basic items:

1) Slide the bitefork arm into the locking device of the facebow
2) Press the axis locator rods inward, center, and tighten
3) Have the facebow level with the pupils
4) Tighten the locking device
5) Open the locator rods and remove

Comes in small steps

and you made it!

POST TEST

1. The objectives of the facebow transfer are:

   a. To record on a mechanical instrument the relationship of the jaw hinge to the teeth, and,

   b. To aid in providing the most functional and aesthetic crowns and bridges possible

   TRUE or FALSE (Circle one)

2. Identify the <u>two</u> anatomical <u>landmarks</u> you will use in locating the hinge axis. Draw a straight line between these points and then indicate where on that line the <u>hinge axis</u> lies.

3. List three important checkpoints for a properly located bitefork:

   a.

   b.

   c.

4. The properly placed facebow will: (Please circle all correct answers)

   a. Be located parallel with an imaginary line drawn between the pupils of the eyes.

   b. Have equal but gentle pressure on the sides of the face.

   c. Will be loosely attached to the bitefork but it can be tightened when the upper cast is placed on the bitefork.

   d. Be placed exactly on the midline of the face by providing equal readings on the right and left axis locator rods.

   e. Will be very firmly attached to the bitefork to prevent any movement during the transfer to the articulator.

5. Listed below are the four steps you might describe to the patient to inform him about the facebow procedure you are going to perform. Number them in the order you would use in your description.

   a. ( ) I will place this bitefork in your mouth and have you hold it gently between your teeth.

   b. ( ) I will tighten the facebow to the bitefork with this knob. Notice a bit of extra pressure for a second or two.

   c. ( ) These instruments will enable me to record the relationship of your teeth to the movement of your jaw. This relationship will allow the doctor to properly design your teeth.

   d. ( ) There will be a little pressure on the side of your ear.

6. Do you now feel confident enough to perform this function? If so, check below the person or persons you would feel comfortable working with.

   a. Another dental assistant in the office

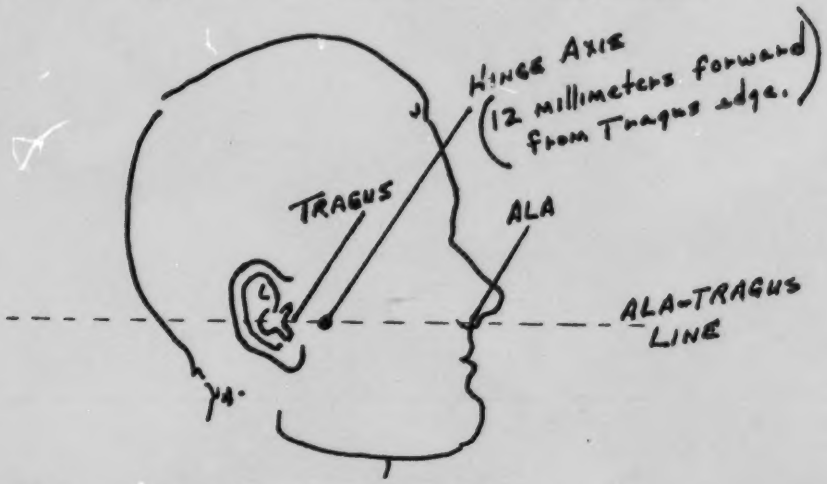
   b. Any of your colleagues

   c. A patient

POST TEST ANSWERS

1. True

2. This is the approximate location of the hinge axis.



3. The three important checkpoints for the bitefork are:

   a. The notch on the bitefork is located on the midline of the upper central incisor teeth.

   b. The wax contains the indentations of all upper teeth.

   c. The bitefork is stable when the wax is chilled and then re-inserted in the mouth.

4. c) is false - all other answers are true

5. The correct sequence for the facebow transfer is as follows:

   2)

   4)

   1)

   3)

6. A and b are best answers.

   C will come after more practice.

Answer Sheet for Practice Questions

1. 1)

2)

2.

3. 1)

2)

3)

4. 1)

2)

3)

4)

5)

Answer Sheet for Post Test

1. Circle one: True False

2.

3. a.

   b.

   c.

4. Circle all correct answers: a b c d e

5. a ( )

   b ( )

   c ( )

   d ( )

6. Check preferred answers: a b c

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ORAL HYGIENE AND DENTURE CARE OF AN EDENTULOUS PATIENT

by

Marion McCullough, CDA

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TITLE OF PACKAGE:	Oral Hygiene and Dental Care of Edentulous Patient
AUTHOR:	Marion McCullough
INSTITUTION:	El Centro College, Dallas, Tex.
INTENDED STUDENTS:	Dental assistant; dental; nursing; denture patients
ESTIMATED WORKING TIME:	20-30 minutes
MATERIALS NEEDED:	1 set dentulous models; 1 set edentulous models; 1 denture toothbrush; 1 ordinary toothbrush; 1 oral irrigation device; 2 sets of dentures (one set clean, one set dirty)

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OBJECTIVES OF UNIT

Overall Objective

Upon completion of this unit, you will be able to instruct an edentulous patient in proper oral hygiene and denture care.

Sub-Objectives

You will be able to:

1. Describe possible types of patients that may be encountered.
2. Describe why care is necessary for the edentulous patient.
3. Describe the types of prophylaxis materials that may be used and that are available.
4. Describe the daily care of the oral tissue.
5. Describe the purpose for proper storage of a denture.
6. Describe the proper method of cleaning a denture.
7. Describe the proper way to insert a denture back in the oral cavity.

INTRODUCTION

This unit is designed to help you teach a denture patient to discover and remove materia alba and bacterial plaque from the oral cavity and their dentures.

Your reward will be the feedback you'll receive from the denture patients in the wonderful new world you have opened to them in their oral health care.

PRACTICE EXERCISE #1

Input

An endentulous patient is a person who does not have any teeth in his mouth.

Practice Question #1

1) An endentulous patient would be described as a patient that

(a) has all of his teeth missing (b) has lost none of his teeth.

2) From drawings A and B below, mark an x on the edentulous cast

WANT TO KNOW IF YOU'RE RIGHT? TURN THE PAGE.

PRACTICE EXERCISE #1 (Cont.)

Feedback

1) If you answered a, you are correct. An edentulous patient is a person who does not have any teeth. Good! Now please continue on.

2) If you chose cast B, you are correct. Please continue with the packet, you're doing well!

PRACTICE EXERCISE #2

Input

During your teaching of oral hygiene, your denture patient will become an important person. It will require tact, patient understanding, and repetition to complete the task as your patients will consist of new people introduced to dentures for the first time - senile patients, people with oral concern, normal (whatever that is) patients, persons confined to nursing homes, hospitals, or home, people who have had strokes and have types of incapacities either in limbs or jaws. Your task will be to teach each to perform as adequate a job as possible and to encourage trying harder.

Practice Question #2

Oral hygiene may be taught to the following denture patients. Check those which you feel are correct.

1) New denture patients
2) Senile patients
3) Cancer patients
4) Rational patients
5) Bed-ridden patients
6) A denture patient from another practice
7) Incapacitated patients

TURN THE PAGE AND SEE IF YOU'RE RIGHT.

Feedback

If you've named all 7 types of patients, you have done well.

You're doing fine, proceed.

Senile patients can be taught: it just takes a longer time with more patient encouragement.

PRACTICE EXERCISE #3

Input

It's important to teach good oral hygiene to denture patients because dentures cover tissues, which keep air and saliva from the area. Saliva has a washing quality, but when it stays under the denture, a white film called materia alba is formed. This is an accumulation of dead cells on covered tissue: these can and do produce an odor if left undisturbed. Tissue, to stay healthy, must have stimulation, removing the denture and brushing the tissue with a soft toothbrush every day stimulates circulation to the area. Teaching patients to brush each day encourages them to also look at their oral tissue; therefore sores and abnormalities may be recognized much earlier. Patients using denture creams or powders each day need remove this material from the tissues daily. Thus patients discover a clean mouth improves taste, breath, and with this gives the patient a self-pride, which at times is lacking because they have a fear of offending.

Practice Question #3

It's important for the denture patient to learn good oral hygiene habits because: (Choose those you feel are correct.)

a. it stimulates the oral tissue

b. it gives the patient an opportunity to look at the oral tissues and detect any abnormalities or sores

c. it gives a clean feeling for the patient as far as taste and breath

d. it gives a patient a sense of pride in self.

TURN THE PAGE FOR RIGHT ANSWERS.

PRACTICE EXERCISE #3 (Cont.)

Feedback

If you checked all of them, you're doing great! Keep up the good work!

PRACTICE EXERCISE #4

Input

Oral hygiene can be accomplished in many ways for the denture patient. The best is a soft toothbrush that fits the oral cavity and toothpaste, but warm salt water solution could also accomplish the same purpose. Oral irrigation devices are an excellent stimulator and of great assistance to persons with oral cancer. Gauze flats may be wrapped around a finger or a tongue blade to assist in cleaning the oral cavity of senile or incapacitated patients if a toothbrush cannot be used. Mouthwashes are used only as a refresher, not a cleaning mechanism.

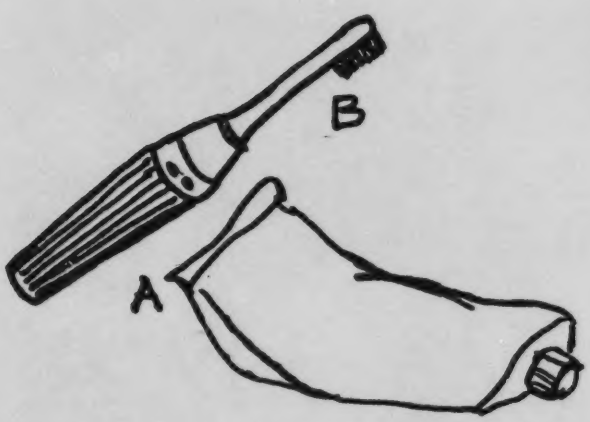
Practice Question #4

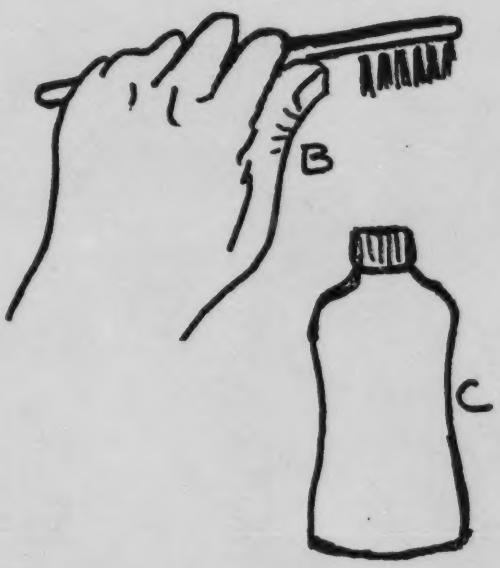
Check each of the following that may be used by an edentulous patient to complete oral hygiene.

a. toothpaste

b. soft toothbrush to fit the mouth - or electric toothbrush with soft bristles

c. mouthwashes





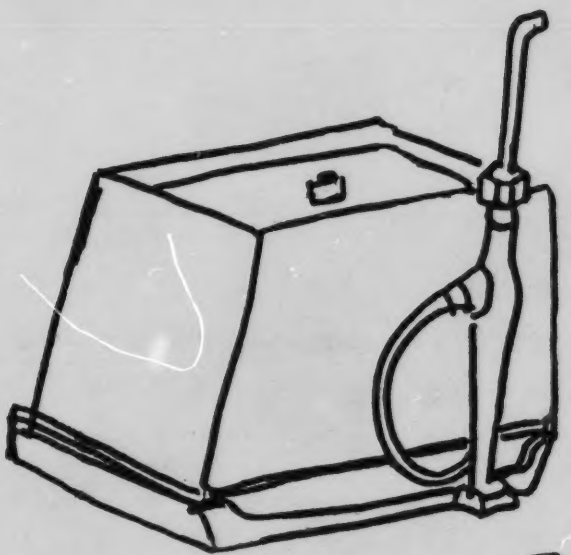
PRACTICE EXERCISE #4 (Cont.)

d. gauze flats

e. oral irrigation devices

f. warm salt water

D



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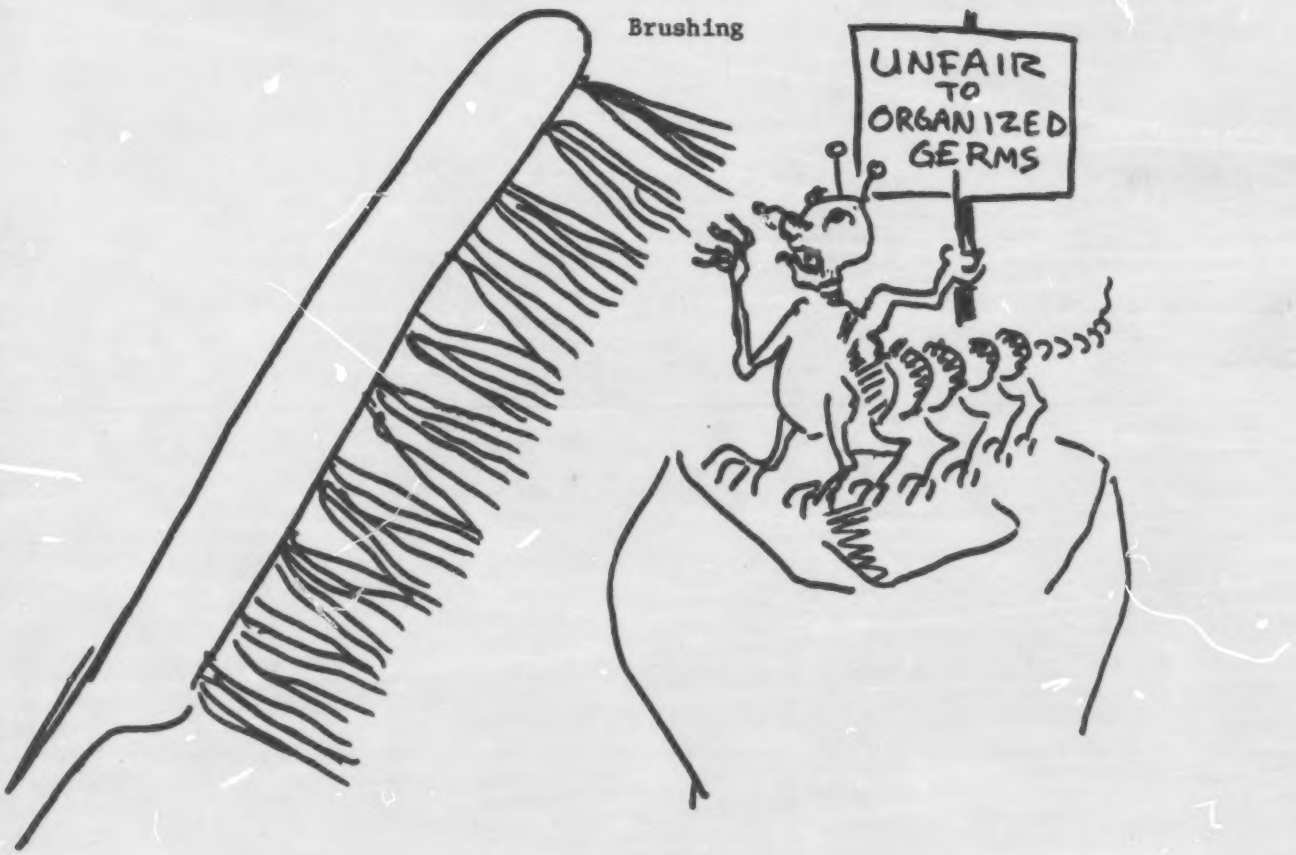
PRACTICE EXERCISE #4 (Cont.)

Feedback

You named all but the mouthwash; great! You're progressing well.



PRACTICE EXERCISE #5

Input

Acrylic is a man-made material and if it dries out there is a possibility of warpage. If this happens, it is impossible for the patient to wear the denture. To repair this type of damage is costly, not only in money, but also in time: the patient must be without the denture. Depending on the damage, it may or may not be able to be repaired, therefore a new denture is the only solution. Therefore, to prevent the above, the denture must be completely submerged in a container of tap water when it's going to be out of the oral cavity for any length of time.

Practice Question #5

Describe in your own words, why is it necessary to keep a denture in water when not in the mouth?

PRACTICE EXERCISE #5 (Cont.)

Feedback

If you have incorporated each of the following in your description then you're doing fine and understand the subject well.

1) Acrylic dries out
2) Acrylic may warp
3) Dentures will not fit properly
4) Costly in time and money
5) Submerge denture completely in water.

See, you can do it - can't you?!!!

PRACTICE EXERCISE #6

Input

To clean the oral cavity and not the denture is a last effort. The denture must be kept clean, as it accumulates food and saliva every day. But to prevent damage to the denture by dropping them, fill a sink with about 2 inches of water. Now brush the denture over the water; thus if the denture slips or is dropped, the water cushions the blow and saves broken teeth and cracked bases on the denture, which are costly and inconvenient to the patient, as repairs take a day and the patient must be without the denture. A good denture brush should be used; it is designed to clean all areas of the denture where a regular brush is not. A dentifrice should be used, but make sure it is not an abrasive cleaner, as this will scratch or scar the denture and cause further problems. An ultrasonic cleaner should be used at least once a week, to remove calculus and debris that a brush cannot remove.

Practice Question #6

Check steps to be followed when regularly cleaning a denture.

a. water pik

b. stopper in sink

c. water in sink

d. denture brush

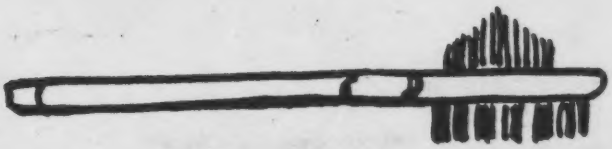
PRACTICE EXERCISE #6 (Cont.)

e. brush denture over water

f. use denture cleaner or toothpaste

g. use an abrasive cleaner

h. use an ultrasonic cleaner



SEE IF YOU'RE RIGHT. TURN THE PAGE.

PRACTICE EXERCISE #6 (Cont.)

Feedback

You didn't check the water pik or the abrasive cleaner.

You are right - Gee, you're doing great! Keep up the good work!

PRACTICE EXERCISE #7

Input

Acrylic is a material that is man-made, and is automatically dry. The oral cavity is moist. Trying to apply something that is dry to something that is moist will produce sticking. The denture will stick to the denture area of the moist oral cavity, with a possibility of the denture not seating properly, tissue burn, or injury. Therefore, wet the denture before placing in the oral cavity and you will find no tissue trauma occurring.

Practice Question #7

Which of the following is the correct way to replace a denture in the oral cavity?

a. Dry the denture and insert it in the oral cavity.

b. Make sure the denture is wet before inserting it in the oral cavity.

LAST LOOK. SEE HOW YOU DID.

PRACTICE EXERCISE #7 (Cont.)

Feedback

You did fantastic: you chose B as the correct answer. Now you are ready to apply your knowledge to a patient.

POST-TEST

1. Which of the following describes an edentulous patient?

   a. a person with all of his teeth

   b. a person with some of his teeth

   c. a person without teeth

2. From the list below check types of patients with dentures you probably will encounter in teaching oral hygiene.

   a. new patients
   b. rational patients
   c. cancer patients
   d. senile patients
   e. incapacitated patients
   f. denture patients
   g. bed-ridden patients

3. Check 4 reasons listed below why it is important for an edentulous patient to have good oral hygiene.

   a. to stimulate oral tissue
   b. early detection of oral disease
   c. aids in pleasant breath
   d. wash denture powders and creams out each day
   e. prevents materia alba formation
   f. aids in digestion
   g. gives the patient a sense of self-pride

4. Check all of the devices that are possible to use in oral hygiene of the edentulous patient.

   a. soft toothbrush
   b. oral irrigation devices
   c. dental floss
   d. mouthwashes or spray
   e. disclosing solutions
   f. gauze flats on finger or tongue blade
   g. warm salt water

5. Choose all 5 steps to follow in cleaning a denture.

a. floss the teeth

b. stopper sink

c. put about 2" of water in sink

d. use denture brush

f. use ultrasonic cleaning device

g. denture cream or toothpaste

h. abrasive cleaner

6. Describe in your own words why it is necessary to keep a denture in water when not in the patient's mouth.

7. Which is the correct way to replace a denture in the oral cavity?

Choose one.

a. Dry it and insert it into the oral cavity.

b. Wet the denture before inserting it into the oral cavity.

This self-instructional package was:

clear	_____	boring	_____
confusing	_____	useful	_____
enjoyable	_____	useless	_____

POST-TEST KEY

1. c. a person without teeth

2. a. new patients
   b. rational patients
   c. cancer patients
   d. senile patients
   e. incapacitated patients
   f. denture patients
   g. bed-ridden patients

3. a. to stimulate oral tissue
   b. early detection of oral disease
   c. aids in pleasant breath
   e. prevents materia alba formation
   f. aids in digestion
   g. gives the patient a sense of self-pride

4. soft toothbrush
   oral irrigation devices
   mouthwash or spray
   gauze flats on finger or tongue blade
   warm salt water

5. b. stopper sink
   c. put about 2" of water in sink
   d. brush denture over water
   e. use denture brush
   f. use ultrasonic cleaning device
   g. denture cleansers or toothpaste

POST-TEST (CONT.)

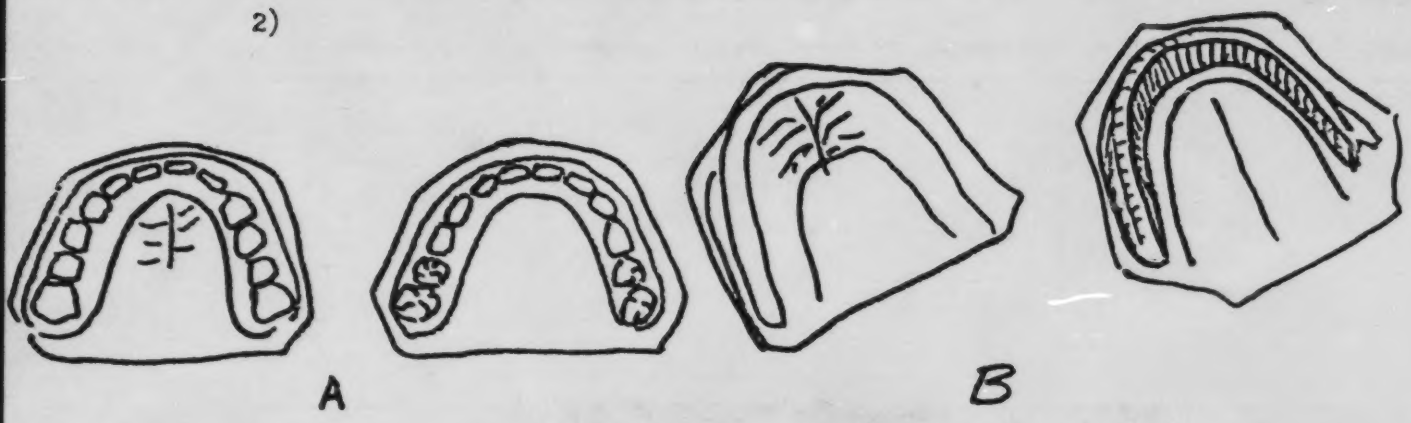
6. Dentures are made of an acrylic material and acrylic will dry out and as it dries it may warp. If a denture warps, a patient will not be able to wear it, so as soon as a denture is removed from the mouth, place it in water and cover it completely.

7. b. wet the denture before inserting it in the oral cavity.

ANSWER SHEET FOR PRACTICE QUESTIONS

1. 1) Circle one: a b

2)



2. _____1) _____5)
_____2) _____6)
_____3) _____7)
_____4)

3. Circle correct answers: a b c d

4. _____a _____d
_____b _____e
_____c _____f

5.

ANSWER SHEET FOR PRACTICE QUESTIONS (Cont.)

6. _____a. _____e.

_____b. _____f.

_____c. _____g.

_____d. _____h.

7. Circle one: a b

ANSWER SHEET FOR POST-TEST

1) Circle one: a b c

2) Circle correct answers:

a. c. e. g.

b. d. f.

3. _____ a _____ e

_____ b _____ f

_____ c _____ g

_____ d

4. _____ a _____ e

_____ b _____ f

_____ c _____ g

_____ d

5. Circle five:

a c e g

b d f

6.

7. Circle one: a b

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BELT REPLACEMENT, ENGINE ARM AND HANDPIECE ALIGNMENT

by

Wesley Wallace

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TITLE OF PACKAGE:	Belt Replacement, Engine Arm and Handpiece Alignment
AUTHOR:	Wesley Wallace
INSTITUTION:	Orange Coast College
INTENDED STUDENTS:	Dental assisting; dental technology
ESTIMATED WORKING TIME:	45 minutes
MATERIALS NEEDED:	Engine Arm and Handpiece dental unit; drive belt; grinding instrument; an observer

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OBJECTIVE:

The student will be able to properly replace the drive belt of an Engine Arm and Handpiece dental unit.

SUB-OBJECTIVES:

1. Identify the need for a new belt. (Damaged, worn, missing.)
2. Remove defective belt, if present, from unit.
3. Arrange Engine Arm and Handpiece unit in correct alignment for belt replacement.
4. Select belt of proper length for unit.
5. Place the belt in the pulleys from the power source, on the engine, to the handpiece.
6. Align the belt in unrestricted sequence through each set of pulleys.
7. Test and observe unit for friction free operation.

INTRODUCTION

An Enginearm and Handpiece is an appliance that is used extensively in the dental office and the dental laboratory. It is used in the various grinding, shaping and polishing procedures necessary to produce an appliance. It consists of three basic units, an engine (Figure 1 A) an arm (Figure 1 B) and a handpiece (Figure 1 C).

The engine, of course, is the main power source; the handpiece is the tool or instrument holder and the arm is simply the means to transmit the power from the motor to the grinding instrument in the handpiece. This power from the engine is made usable at the handpiece by employing a belt from the main power pulley on the engine, running through three successive sets of pulleys along the arm to the handpiece. The belt is constructed of linen and while it is quite strong it becomes, on occasion, frayed or broken. When this occurs it is necessary to place a new belt on the appliance. It is the replacement procedure or technique that we are now going to attempt.

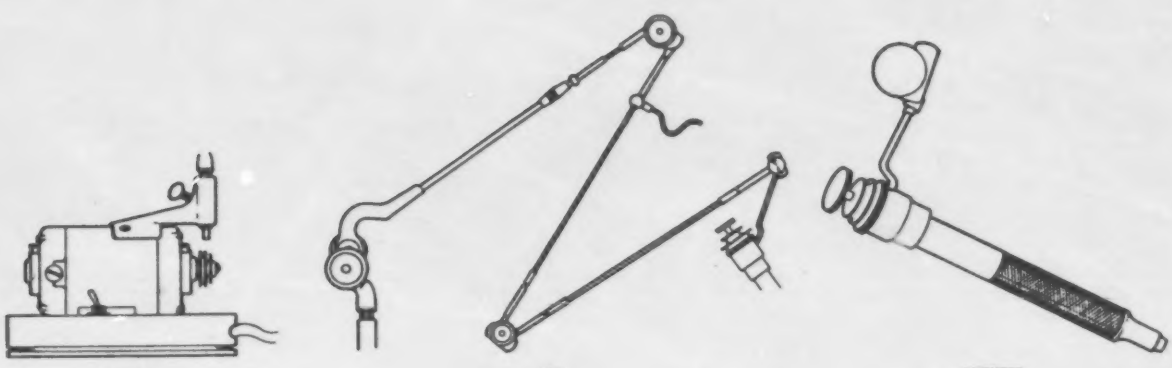

FIG 1a FIG 1b FIG 1c

It will now be necessary to assess the condition of the unit to be worked with.

YES	NO

1. Is the Engine Arm without a belt?
2. If the belt is present, is it in a condition that would prevent it from passing through each set of pulleys in a vibration-free, smooth manner?

If the belt is found to be defective and is in need of replacement, it must now be removed.

REMOVAL OF BELT:

1. The knurled nut (Figure 2) on the engine arm should be located and turned counterclockwise, thereby loosening it. The arm will now telescope into itself and make the arm shorter, which will take the tension off the belt. Is the nut now loose and the arm shortened? Great, you're doing fine.

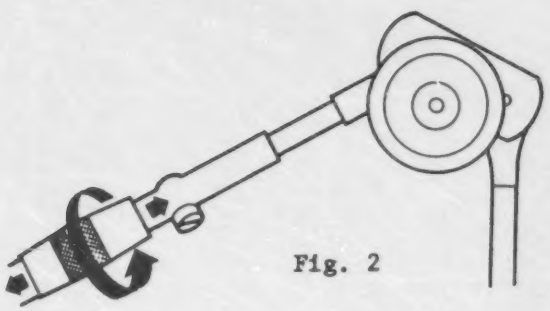

Fig. 2

This knurled nut may at times be difficult to loosen with just finger pressure. If pliers must be used, they should be cushioned by a cloth towel. If belt guards (Figure 2) are present they should be loosened with a small screwdriver, but not fully removed.

2. The belt is first removed from the main drive pulley next to the engine (Figure 3). Is the belt now loose? Good.

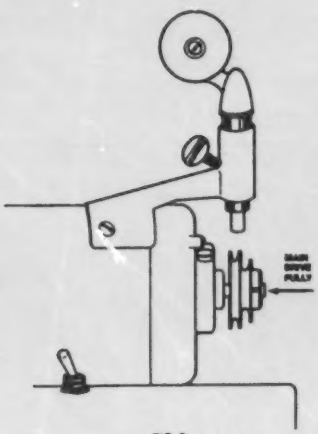

FIG 3

3. Now remove the belt from each of the successive sets of pulleys on the arm. Is the old belt now completely free of the machine? Good. You have now completed the first step in this operation.

Now that we have removed the belt from the pulleys and have found the pulleys to be free of debris, we will now align the pulleys in preparation for receiving the new belt.

YES	NO

YES	NO

ALIGNING THE PULLEYS:

1. The first set of pulleys, on the arm (next to the main power pulley) must be aligned directly over the power pulley (Figure 4).

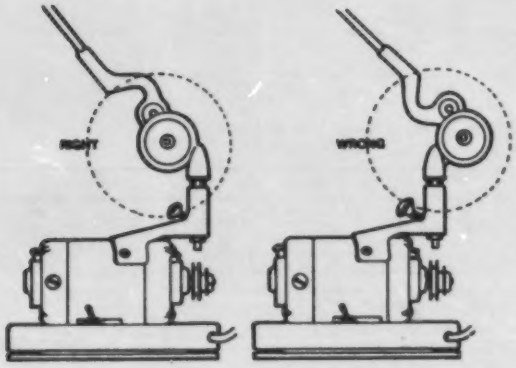

FIG 4

2. The remaining sets of pulleys should be aligned in a straight configuration and in alignment with each other. (Figure 5.) Are all pulleys in tentative alignment?

3. Do the sets of pulleys now appear as they do in Figure 5? Great, you are progressing very well.

YES	NO

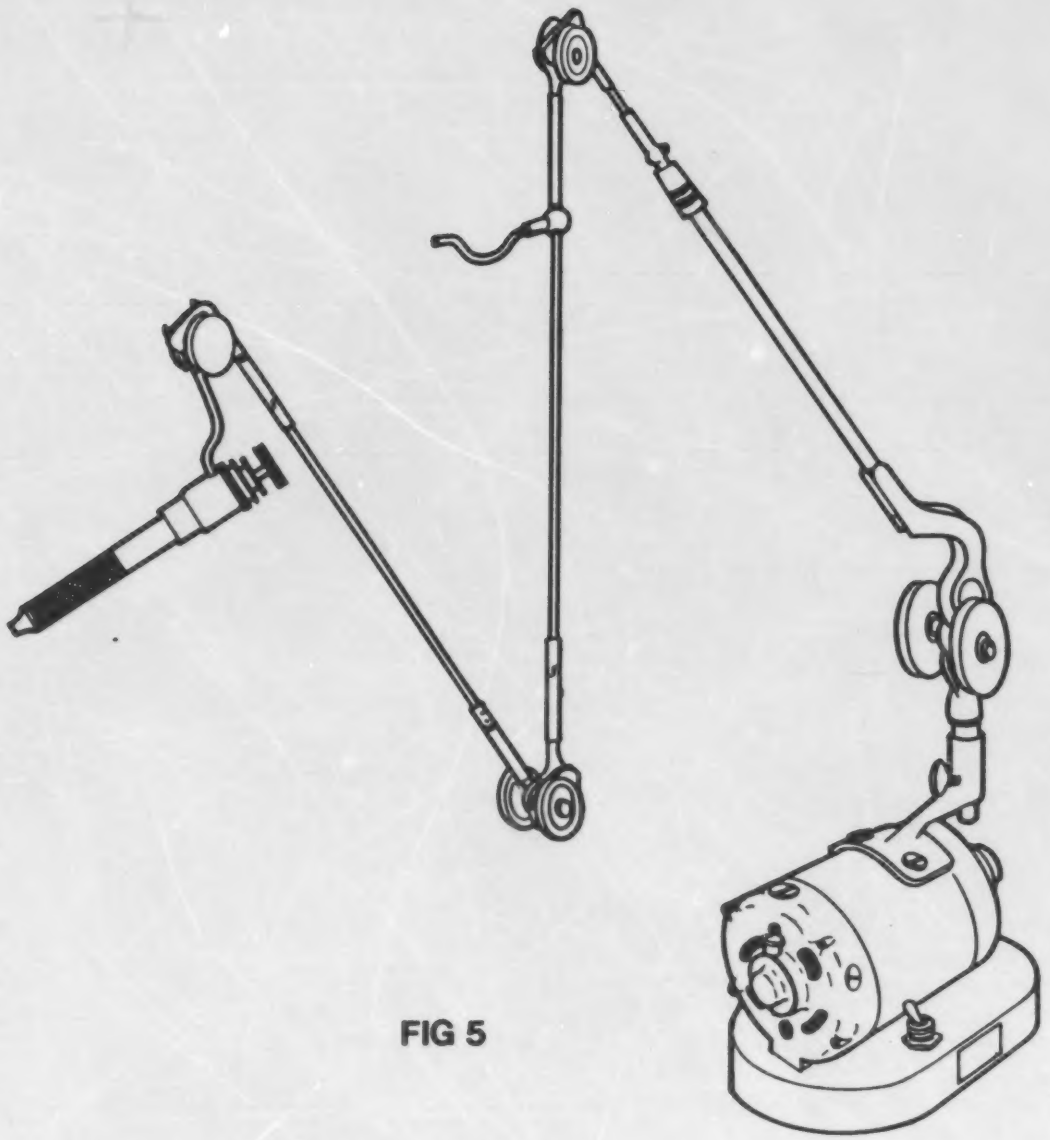

FIG 5

	YES	NO
BELT SELECTION:		
Several belt lengths are available for replacement purposes. While the arm is adjustable it will only accomodate a few inches. It is therefore necessary to choose the correct length of belt for the machine you are working with. Standard lengths are 6' 2" for piccalo arm units and 9' 6" for the larger unit.		
1. Have you selected a belt replacement that is of proper length?		
Just great, we are now ready to begin. We are now ready to place the belt, of correct length, on the pulleys of the unit.		
REPLACING THE BELT: NOTE -- Read this unit through the "Memory Jogger" before attempting to place the belt on the arm.		
1. Place the belt under the main power pulley.		
2. We will now bring the belt over the top of the first set of pulleys from the main power source, over the next successive set of pulleys, now under the next set, under the following set and finally over the top of the pulley on the hand piece. Whew! Read on.....maybe a memory jogger would help. We will use "B" for bottom, or under (in reference to the pulley) and use "T" for top, or over the pulley. Now, lets try this: begin		

at step one, main power source, using "B" for bottom, "T" for top -- we go under or bottom, top, top, bottom, bottom, top -- ooorrr --

B = Boys

T = Think

T = That

B = Base

B = Balls

T = Talk

(Boys think that baseballs-"base balls"-talk.)

Try it, you'll like it. Are they, the pulleys, all engaged with the belt? Beautiful, you are to be congratulated! Let's see now if our efforts have achieved what we set out to do.

YES	NO

CHECKING THE BELT:

1. Does the belt move freely through each set of pulleys, without rubbing the arm? Good. So far, so good.
2. When the handpiece is allowed to hang freely does the belt proceed in a straight, continuous non-crossing loop from power source to handpiece? Fantastic! You're doing just fine.
3. Now grasp the handpiece in the proper working position in the hand, apply a small amount of power and observe that the belt runs free of friction through each and all sets of pulleys. The objective of the belt is to transfer the

power of the engine to the handpiece. If the belt is too tight (like a guitar string) it will expend too much energy or power just to pass through the pulley, thereby making it less effective. If, on the other hand, it is too loose sufficient power will not be transmitted to the handpiece for effective use. Does the belt, when power is applied, turn the handpiece? Real fine. Now lets adjust the tension on the belt by lengthening or shortening the arm by expanding or contracting at the telescoping section, below the knurled knob, as shown in Figure 2

4. The knurled nut is again loosened and tension should be placed on the belt by lengthening the arm between the pulleys where the knurled nut appears. Have you increased the length of the arm, thereby increasing the tension on the belt?
5. Good, now tighten the knurled nut and put power to the unit. Does it appear to be laboring (too tight)?
6. Does it appear to be so loose that it will have no torque or power at the handpiece?

YES	NO

By George, I think you've done it! Lets now check all phases of the belt's operation in order to ascertain if the maximum power is being transferred from power source to handpiece.

CHECKING BELT OPERATION:

YES	NO

1. Select an appropriate grinding instrument and affix it in the handpiece.
2. Now apply power to the unit and place the selected grinding instrument on the plaster of Paris model. With power on, and the grinding instrument turning, does it require considerable pressure to slow the cutting process?
3. Good, now lets loosen the tension on the knurled nut and repeat the procedure of grinding. Is the cutting instrument performing in a satisfactory manner? At this point you must decide amount of tension on the belt that is most efficient and secure the knurled nut at that point. If all these things; belt tension, belt alignment and maximum power at handpiece seem to be in harmony you are to be congratulated. You have completed a rather difficult, but often necessary, function. You can be very proud of your accomplishment.

If you feel confident, as you should, lets take the next page entitled "Engine Arm Belt Replacement Check Sheet," find a fellow student that will observe you performing the tasks you have just completed and record your activities. Good Luck. You should begin at step one and, without the use of this instructional unit, attempt to replace the drive belt in an engine

arm and handpiece unit from memory.

If you should become stalled, after every attempt at recalling the next procedure has failed, you may request aid from your observer. If you do need a hint, complete the unit and then immediately begin at step one again until you are able to complete the procedure from memory.

When you do complete the task of belt replacement without help, you may congratulate yourself for a difficult task well done and treat yourself to a coffee, soft drink or snack.....you deserve it!

ENGINE ARM BELT REPLACEMENT CHECK LIST

	YES	NO
1. Inspect unit for faulty belt.		
2. Loosen knurled knob on shaft.		
3. Remove belt from power pulley and then successive pulleys.		
4. Belt completely free from unit.		
5. Arrange the pulleys in straight alignment.		
6. Select belt of correct length.		
7. Begin belt application at main power source.		
8. Each successive set of pulleys are engaged following: Boys Think That Base Balls Talk sequence.		
9. Inspection for correct alignment.		
10. Adjustment of tension.		
11. Handpiece engaged with cutting instrument.		
12. Trial grind tight.		
13. Trial grind loose.		
14. Final correct adjustment and test.		

POST-TEST

1. The Engine Arm drive belt must be replaced if the belt is:

   _____, _____, or _____.

2. From which pulley do you first remove a defective belt?

3. The first set of pulleys must be aligned directly over the power pulley; the remaining sets of pulleys should be aligned in a _____ configuration.

4. Standard belt length for piccalo arm units is _____.

5. What is the six-word memory jogger to help you remember the placement sequence of a new belt over and under pulleys?

6. A properly installed belt runs free of _____ through all sets of pulleys.

POST-TEST ANSWER KEY

1. Damaged, worn, missing
2. Main drive pulley next to the engine
3. Straight
4. 6' 2"
5. Boys Think That Base Balls Talk
6. Friction

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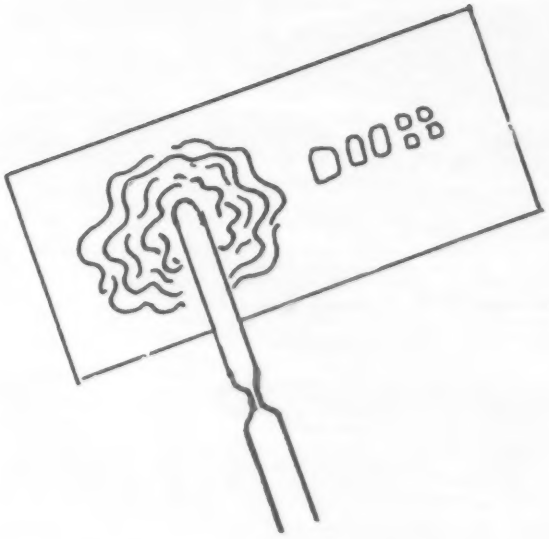
MIXING ZINC PHOSPHATE CEMENT

by

Clinton L. Nelson, D.M.D.



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TITLE:	Mixing Zinc Phosphate Cement
AUTHOR:	Clinton L. Nelson, D.M.D.
INSTITUTION:	Lane Community College Eugene, Ore.
INTENDED STUDENTS:	Dental
ESTIMATED WORKING TIME:	50 minutes
MATERIALS NEEDED:	Zinc oxide powder; phosphoric acid; glass slab; cement spatula; plastic powder dispenser

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INTRODUCTION

The class of dental materials used for attaching fabricated dental appliances is called dental cements. There are several types of dental cements on the market today. One of the more common is zinc phosphate cement.

To insure maximum performance of the zinc phosphate cement and to be as efficient as possible, you must mix zinc phosphate cement properly.

This package is designed to teach you that skill.

Please read through the complete unit before attempting to do the exercise.

OVERALL OBJECTIVE

Mix zinc phosphate cement correctly for cementation of a fixed dental appliance.

SUBOBJECTIVES

The student will be able to:

1. State the essential ingredients and physical properties of zinc phosphate cement which make it a good dental cement.
2. Describe the proper care and storage of zinc phosphate cement that has been opened.
3. Select and prepare the necessary armamentarium and materials to mix zinc phosphate cement.
4. Mix the zinc phosphate cement to the proper consistency and prepare it for cementing a fixed dental appliance.
5. Clean the glass slab and cement spatula.

PRACTICE EXERCISE #1

INPUT

Zinc phosphate cement is used to cement (or lute) fixed dental appliances in the mouth. Zinc phosphate is packaged in a bottle of powder, zinc oxide; and a bottle of liquid, phosphoric acid. Some manufacturers add other ingredients, but the main ingredients are zinc oxide powder and phosphoric acid liquid.

PRACTICE QUESTION #1

What are the main ingredients of zinc phosphate powder? the liquid?

A.

B.

FEEDBACK #1

If you answered zinc oxide for the powder and phosphoric acid for the liquid, you are correct.

PRACTICE EXERCISE #2

INPUT

The physical properties of zinc phosphate cement which make it a good dental cement are: it has adequate strength; it provides mechanical retention; it flows to allow adequate film thickness; and there are insignificant dimensional changes upon setting or when it is exposed to thermal variations.

PRACTICE QUESTION #2

The physical properties which make zinc phosphate a good dental cement are?

A.

B.

C.

D.

FEEDBACK #2

If your responses to the question were: (1) Adequate strength, (2) Mechanical retention, (3) Proper film thickness, (4) Insignificant dimensional changes upon setting or thermal variations, you are a veritable whiz kid, proceed!

PRACTICE EXERCISE #3

INPUT

The zinc phospate liquid and powder comes in sealed bottles. Once the liquid is opened and exposed to the atmosphere it can give up water or absorb water depending upon the atmospheric pressure. Alteration of the concentration of the liquid will have a direct effect upon the setting time of the cement. An increased concentration of water will decrease the setting time. A decreased concentration of water will increase the setting time. Such an effect is related to the degree of ionization of the liquid. Insufficient water in the liquid is often evidenced by crystals on the side of the bottle or general cloudiness of the liquid. It is important to keep the liquid from becoming contaminated because it may not be used up for a month or more.

Practice Question #3

A. What effect does the concentration of water in the liquid have on the setting time of zinc phosphate cement?

B. How can you tell when water has been lost from the liquid?

Feedback #3

Your answers for Part A should be: (1) Increased water content, decreased setting time, (2) Decreased water content, increased setting time. Part B should be: (1) Crystal formation, and (2) Cloudiness. If you are 100% on this material let's get the materials and equipment to mix the cement.

PRACTICE EXERCISE #4

INPUT

The necessary materials for mixing zinc phosphate cement are: powder, liquid, a glass slab, cement spatula, and plastic powder dispenser.

When zinc oxide and phosphoric acid are mixed together, a great deal of heat is generated, an exothermic reaction. The glass slab is used to help dissipate the heat generated from the mixing of zinc oxide and phosphoric acid. The cement spatula was designed to be used to mix dental cements and should not be substituted. The plastic cement dispenser was designed for zinc phosphate cement. It has a large container, a scoop on one end and a small scoop on the other. It is necessary to use the plastic cement dispenser to insure the proper powder/liquid ratios.

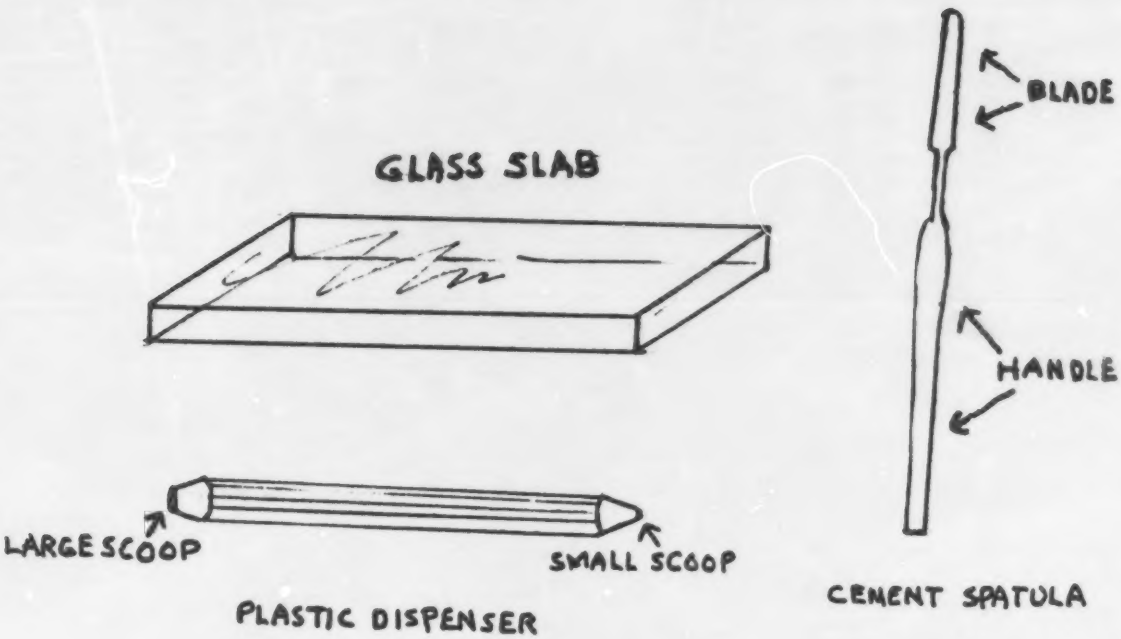
PRACTICE QUESTION #4

A. Why is it necessary to use a glass slab when mixing zinc phosphate cement?

B. Why use a plastic cement dispenser when mixing zinc phosphate cement?

Feedback #4

Your answer should be: (A) To help dissipate the heat generated when mixing zinc oxide with phosphoric acid. (B) Proper powder/liquid ratio.



Prior to placing the powder and liquid on the glass slab, cool the glass slab under cold tap water. Be careful not to get the slab so cold the temperature is below the dew point. When something is cooler than the dew point, moisture spontaneously forms on the object. The slab is cooled to absorb the heat generated when the powder is mixed into the liquid, an exothermic reaction.

PRACTICE EXERCISE #5-10

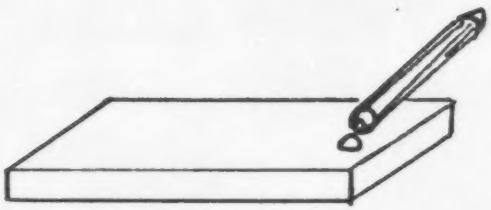
It is time to dispense the powder onto the glass slab. The proper powder/liquid ratio is one large scoop of powder to three drops of liquid. Remember that the ratio is one large level scoop of powder/3 drops of liquid.

This can be 2 scoops/6 drops, 3 scoops/9 drops, etc. depending upon the amount necessary to complete the task.

For our purposes, use two large scoops of powder.

1. Place the large end of the scoop straight up and down in the bottle of powder.

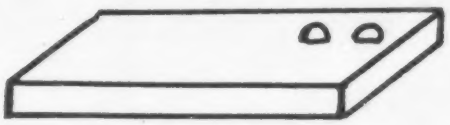
The powder should stick in the scoop.



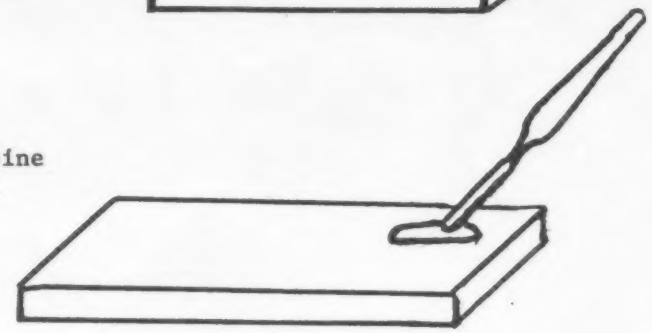
2. Remove the scoop from the bottle and carry it to one end of the glass slab.

A. It may be necessary to gently tap the plastic scoop with the cement spatula to release the powder.

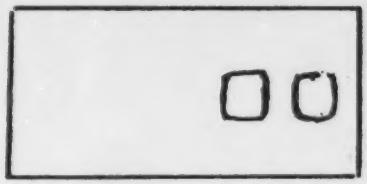
3. Repeat the procedure so there are two scoops of powder on one end of the glass slab.



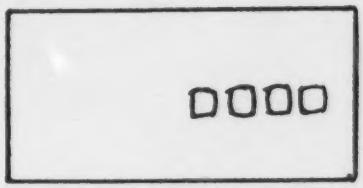
4. Use the spatula and combine the two piles of powder.



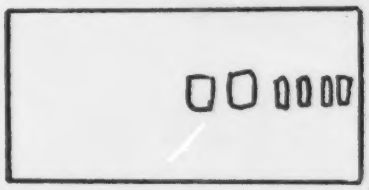
5. Divide the powder in half. Note: Mixing zinc phosphate cement is based on a time sequence. The powder is divided into portions and mixed for ten seconds each. By pre-proportioning the powder, it cuts downs on errors and deviations from a properly mixed cement.



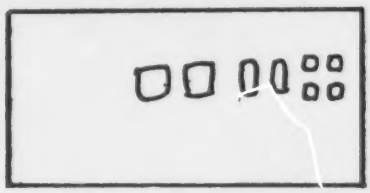
6. Divide each pile in half again. You should have four smaller piles which are relatively equal.



7. Divide the two piles closest to the edge of the slab in half. You should now have six piles of powder.

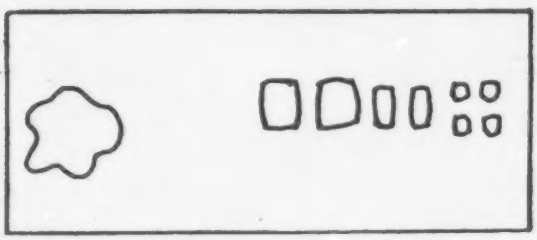


8. Divide the two piles closest to the edge of the slab in half. You should have eight piles of powder.



9. Fill the dropper with liquid and remove it from the bottle. The liquid should not be placed on the slab until ready to mix because it can pick up or lose water depending upon atmospheric conditions.

10. Place <u>six</u> drops of liquid on the opposite end of the glass slab.

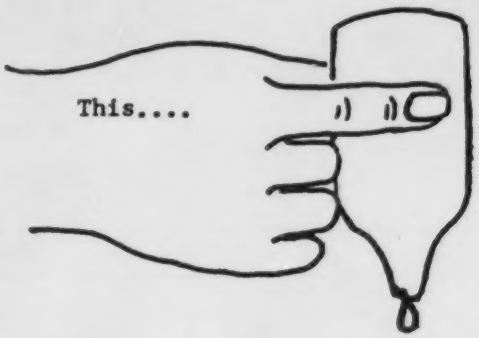


Remember: Powder/liquid=

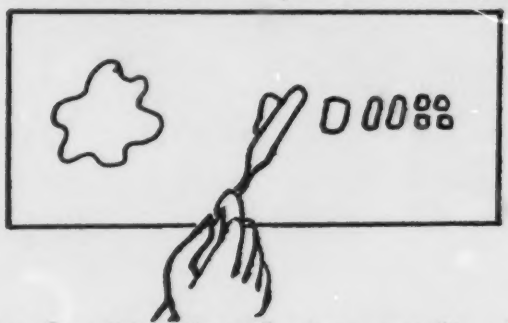
one scoop/3 drops

We used two scoops of powder.

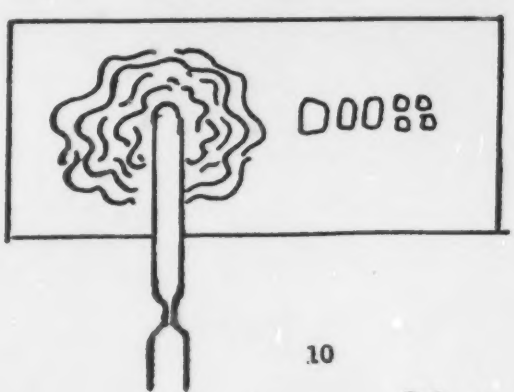
Note: Be sure to have the opening or barrel of the dropper parallel to the glass slab. If this is not done, it will change the volume of the drop of liquid.



11. With the cement spatula, slide the first portion of powder across the slab and incorporate it into the liquid.

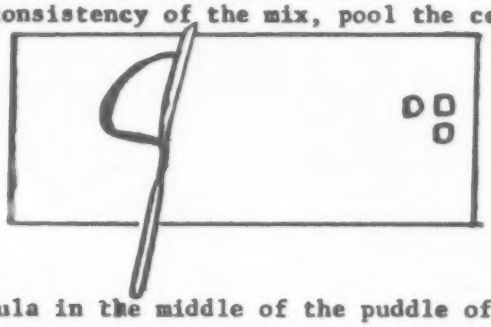


12. With a rotary motion mix the powder for approximately ten seconds. The object is to make all the particles of powder wet. Be sure to use at least half the slab to mix on. The total mixing time should be approximately 1-½ minutes; or ten seconds per pile of powder. Note: Keep the blade of the spatula flat on the slab. It is not necessary to rotate the spatula at a rapid pace. You should mix for approximately ten seconds, however.

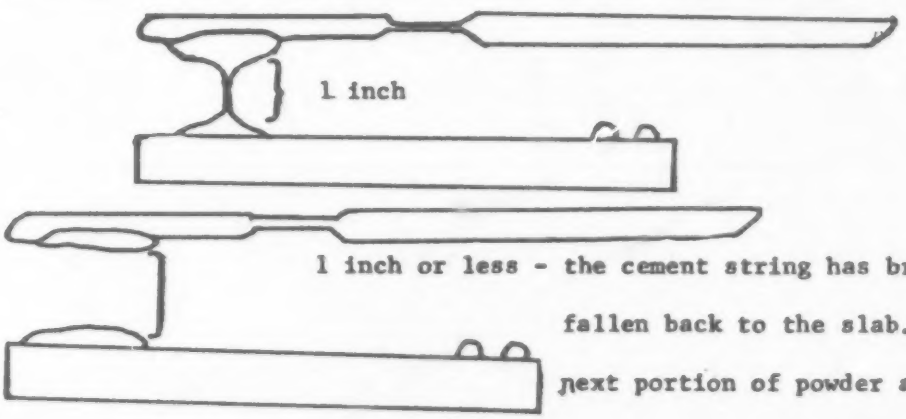


13. Repeat the above steps for each portion of powder. Mix each portion for approximately ten seconds. Note: When there are only three piles of powder left, check the consistency of the mix.

14. To check the consistency of the mix, pool the cement with the spatula.

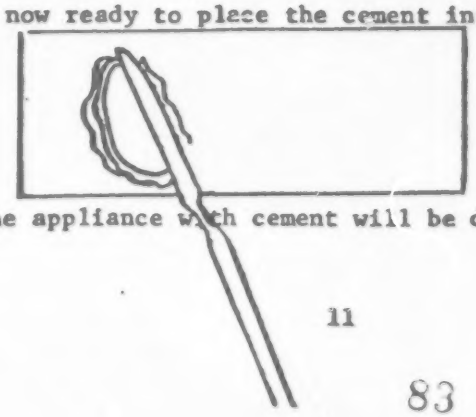


15. Place the spatula in the middle of the puddle of the cement. Raise the spatula straight away from the slab. If the cement can be raised more than one inch from the slab before it breaks and slumps back to the slab, it is too thin. Add the next portion of powder and check the consistency again.



1 inch or less - the cement string has broken and fallen back to the slab. Add the next portion of powder and recheck.

16. When the mix of cement is thick enough to raise from the glass slab at least one inch before separating and falling back to the slab, repool the cement. You are now ready to place the cement into the appliance which is to be cemented.



The loading of the appliance with cement will be dealt with in the clinical setting.

17. Zinc phosphate cement is very difficult to clean from the glass slab and cement spatula if allowed to set on either instrument. It is best to place both under water prior to its setting up. If the cement happens to set before getting either the glass slab or spatula cleaned, sodium bicarbonate can be used to remove the cement.

PRACTICE QUESTIONS #5

A. What is the powder/liquid ratio to mix zinc phosphate cement for cementing fixed appliances?

B. How many portions did you divide the powder into?

C. Why should the liquid not be placed on the slab until you are ready to mix the cement?

D. Why is it important to hold the liquid dropper properly when dispensing the liquid?

E. How long should each portion of powder be mixed?

F. When you check for the proper consistency of the mix of cement, how far can the spatula be raised from the slab without the string of cement breaking and slumping back to the slab?

Feedback #5

A. One large scoop of powder/3 drops of liquid. B. Eight. C. The liquid can lose or gain water depending upon atmospheric conditions. D. If the opening of the dropper is not held parallel to the slab, the proper sized drop of liquid will not be dispensed. E. Ten seconds. F. At least one inch.

POST-TEST

A. What are the essential ingredients of zinc phosphate cement? There can be more than one answer.

B. List the physical porperties of zinc phosphate cement.

1.
2.
3.
4.
5.

C. Which ingredient is the powder? Which is the liquid?

1. 2.

D. Why is it critical to prevent contamination of the liquid?

1. 2.

E. Why is it important to use the special equipment to mix zinc phosphate cement?

F. How can you tell if evaporation takes place in the liquid?

G. What are the reasons for preliminary preparation of the ingredients prior to mixing the cement?

1. 2. 3.

H. Why do you use a large area of the glass slab to mix zinc phosphate cement?

I. What is the mixing time for zinc phosphate cement?

J. How do you determine the proper consistency of a zinc phosphate cement which is to be used for cementing a fixed dental appliance?

ANSWERS TO POST-TEST

A. Zinc oxide, phosphoric acid.

B. Adequate strength, Mechanical retention, Proper film thickness, Insignificant dimensional change upon setting, Insignificant dimensional change due to thermal variations.

C. 1. Zinc oxide powder 2. Phosphoric acid liquid

D. Contamination of the water will change the setting time of the mix!

1. Dilution of the liquid decreases the setting time.
2. Concentration of the liquid increases the setting time.

E. The glass slab absorbs the heat created when the powder and liquid are mixed together. Cement spatula is used because it was designed for that purpose.

F. If the liquid becomes cloudy.

G. Save material, save time by mixing properly and for the designated time

H. Dissipate heat.

I. 1.5 minutes

J. After pooling the cement together, a portion of the cement is slowly lifted from the glass slab with the spatula. When the cement can be lifted one inch from the slab without breaking and falling back to the slab, it is of the proper consistency.